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ROYAL BOTANIC GARDENS, KEW.

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XXVIII.—A VISIT TO THE CAMEROONS AND NIGERIA.

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By the desire of the Rt. Hon. the Secretary of State for the Colonies (Viscount Milner) acting on the request of His Excellency Sir Hugh Clifford, G.C.M.G., Governor of Nigeria, I was enabled, with the permission of the Minister of Agriculture and Fisheries, to visit the Cameroons and Nigeria in February and March last.

The main object of my deputation was to visit and report upon the Botanic Gardens established at Victoria, Cameroons, and to advise the Government of Nigeria as to whether they should be maintained as a Botanic Garden, and if so as to the steps that should be taken for their restoration and future maintenance.*

I left England for this purpose on January 19th and proceeded direct to the Cameroons where I arrived in the evening of February 11th. On February 24th I left the Cameroons, after a tour of remarkable interest, and landed at Calabar the following day, having spent the previous night at Rio del Rey on the border of the two regions.

His Excellency having arranged that I should also see as much as possible of the work of the Agricultural Department in Nigeria, I spent two days in Calabar and made a careful examination of the Botanic Garden with the late Mr. G. R. Pierez, Assistant Superintendent of Agriculture in charge of the Station, before continuing my journey to Lagos.

Owing to an unfortunate misunderstanding of telegrams, it appeared impossible to travel overland via Onitsha and Benin City to Ibadan, so I made my way from Calabar to Itu by launch up the Cross River, thence by car through Ikot Ekpene to Aba and from there by train to Port Harcourt.

From Port Harcourt I travelled by the collier "Diana" to Lagos, where I was met by Mr. Kirby, Acting Director of Agriculture, Southern Provinces, and went by car the same day to Agege, where we spent two nights and inspected the plantation

* Nigerian Council, address by the Governor, Dec. 29th, 1920, pp. 185, 186.

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and several cocoa farms in the neighbourhood. We then went by train to Ibadan, the headquarters of the Agricultural Department, Southern Provinces, Nigeria, where I stayed some ten days before proceeding to Northern Nigeria and the Bauchi Plateau.

The Victoria Gardens.

The site chosen for the Botanic Gardens could hardly have been more appropriate both as regards natural beauty and with reference to soil conditions and the general character of the ground, which includes both flat land by the river side and a good deal of hilly ground.

The Garden area is situated between the township of Victoria and the village of Bota, lying about a mile and a half apart on the shore of Ambas bay.

To the north rises the magnificent Cameroon mountain from whose slopes comes the Limbe river which traverses the Garden, tumbling over boulders like some mountain stream in N. Wales, and flows into the bay at the Victoria or southern end of the Garden. (Plate I., fig. 2).

Even had the site not been transformed into a Garden, its natural beauty would have been remarkable, bounded as it is by the sea on the western side, rising to a considerable elevation towards the north with a precipitous cliff on the seaward side and traversed by the broad stream falling in rapids and cascades towards the sea. Looking up the valley of the Limbe, the mass of the Cameroon mountain forms an imposing background, the view being flanked by low hills covered with Palms and Tropical vegetation.

As soon as I had set foot in the Gardens, it would, I felt, be a lasting discredit—as His Excellency so forcibly says in his address to the Nigerian Council*—if the Nigerian Government "were to neglect to repair the damage which the war has already unhappily inflicted upon these lovely and valuable Gardens."

The damage caused by the years of comparative neglect since the Gardens came under British control is fortunately not so serious as might be expected, and I was glad to be able to report that no large expenditure either of time or money would be needed to restore them to a state of proper order and efficiency.

The area of the Gardens is about 200 acres, but should an outlying area to the East, which has been cut off from the latest map as here reproduced—the exact boundary of which is not precisely defined, be included in the restored garden, its area would probably be a good deal larger.

The Botanic Garden proper, which lies between the river and the sea, has been laid out with considerable skill and in its landscape effect leaves little to be desired. Owing to the neglect

* Nigerian Council, address by the Governor, pp. 185, 186.

of the past few years certain trees have grown too large and prevented others of greater interest from developing properly, while near the river certain trees and shrubs will have to be removed in order to obtain the full value of the river, but these are matters of detail which need not be elaborated here.

As in other Tropical Botanic Gardens, the trees and shrubs are mainly exotic species. Many of them are of considerable economic value and others are of more purely scientific or æsthetic interest. It was disappointing to find that the native Cameroons vegetation was almost unrepresented, and the same remark applies, as regards the Nigerian flora, to the Gardens at Calabar and to Moor Plantation, Ibadan.

Several varieties of the Oil Palm (*Elaeis guineensis*), including the Lissombe were very rightly to be found under cultivation at Victoria, but many native plants of great beauty and possible economic value were unrepresented.

In the Garden proper certain areas were devoted to examples of such plants as Cacao, *Hevea brasiliensis*, Oil Palms, *Citrus*, Mangos, Nutmegs, Teak trees, *Haematoxylon*, Cedrelas, *Michelia Champaca*,* and other economic trees and shrubs.

To the East of the river large plots were occupied with plantations of Pine apples in variety,† Cacao, *Funtumia*, *Ficus*, *Hevea*, *Raphia*, *Kola*, Teak, Coffees, Bananas, Oranges, &c., which are indicated generally in the map.

To the West of the river there is a good collection of exotic Palms and some magnificent Cycads, and all the more important paths are planted with avenues of introduced trees or Palms such as *Michelia Champaca*, *Calophyllum inophyllum*, *Terminalia Catappa*, *Martenezia*, *Areca*, &c.

The Garden is well furnished with useful buildings in which research work and the teaching of agricultural pupils was carried on. The buildings located in different parts of the Garden, which are numbered in the map, are—

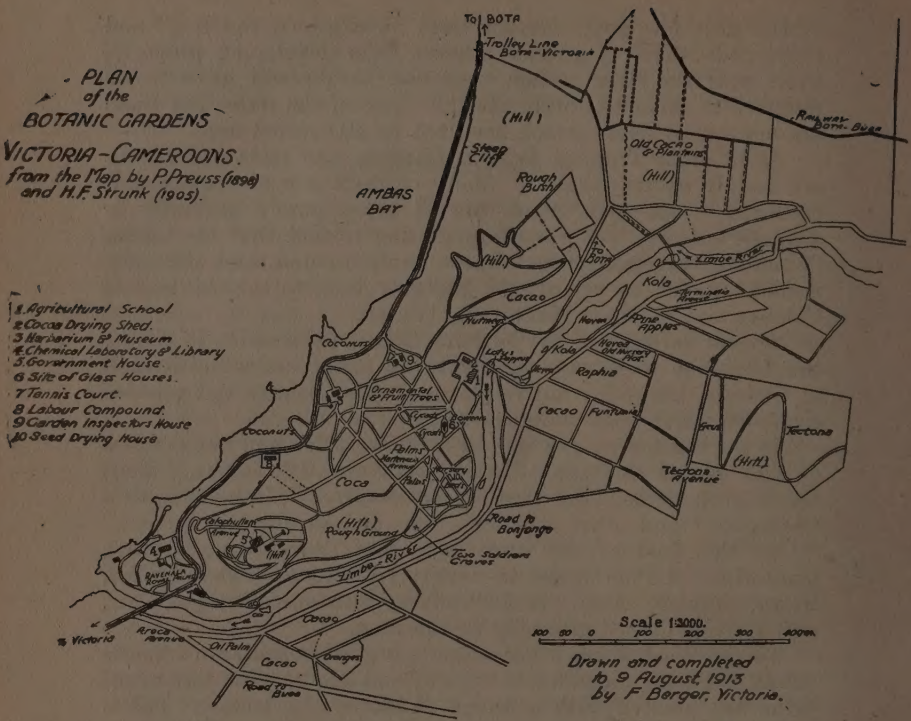
(1) *The Agricultural School*—now the Garden office—consisting of two rooms below where instruction was given to the first and second year pupils, and rooms above where the boys were housed. These upper rooms are now occupied by the Garden's Foreman.

(2) *A small Cacao-drying shed* used for Demonstration purposes close to the school buildings.

(3) *The Herbarium and Museum* consisting of three good rooms with living rooms above. The contents of the Herbarium have been removed, though a few of the tin cases contain sheets of plants, badly eaten by insects, and a few specimens of little value still remain in the Museum cases.

* *See* Deistel, H. "Tropischer Gartenbau," Deutsche Tropen-Bibliothek Bd. 1. Hamburg. Plate facing p. 20.

† Deistel l.c. Plate facing p. 16. All the Plates in this work are from photographs taken in the Victoria Gardens.



The removal of the specimens to a place of safety has no doubt ensured their preservation, but their proper home is at Victoria, and it is essential that they be returned there when the Gardens are placed under scientific management.

(4) *The Chemical Laboratory and Library*, well stocked with chemicals and containing a quantity of apparatus of considerable value. The rooms are fitted with benches, etc., and the book cases are filled with a very good collection of scientific books.

The upper portion of this building is a good house, and the whole building is now in the occupation of the medical officer.

(5) *Government House*, which is only occupied when the Resident comes down to Victoria from Buea. This stands on the summit of the steep hill at the Victoria end of the Garden, and the views over the Garden and Victoria, or away inland towards the mountain, or in the seaward direction are magnificent.

The other sites marked on the map are :—

(6) The site of two greenhouses where orchids were grown, the glass and framework of which were removed to Buea.

Plate II.

FIG. 4.

FIG. 3.

(7) a tennis court,

(8) a small and very unsightly block of native huts, near the sea, erected by the late owners for the Garden labourers, which should be removed if the Garden is restored as at present they are a great eyesore.

(9) There is also the Garden Inspector's house, No. 9 on the map, and a small seed-drying house (10).

The buildings, as may be supposed, have suffered a good deal from neglect, but, as they are well built, it should not prove very costly to restore them to their former condition and make them valuable Laboratories and Offices and a School for carrying out the research and educational work of the Gardens.

In connection with the Garden at Victoria some experimental plots had been made at Buea at elevations of 3400 ft. and upwards on the slopes of the Cameroon mountain. These now come under the manager of the Government Farms at Buea and it was here that experiments were made, and are still continued, in the growing of every kind of vegetable cultivated in European gardens. The stock farm for cattle and pigs is also situated at Buea.

Experimental plots of Tea and Cinchona had been made at Buea, and these though very neglected and now considerably choked with rough grass and bushes prove that both these economic plants are amenable to the conditions at 3400–3600 ft. on the slopes of the mountain. The Tea plants are in two plantations and the bushes of a somewhat pyramidal shape are now some 10–15 ft. high, many of them being in flower and fruit at the end of February. The Cinchonas are slender trees, densely smothered at the base with rank growth and are some 20 ft. high and evidently of several varietal forms, hybrids apparently of *C. succirubra* and *C. Ledgeriana*.* Neglected as they are, they have grown fairly well, and it seems evident that the cultivation of Cinchona might be a practical proposition. (Plate II., figs. 3 and 4.)

At Buea or at some other mountain station it should be possible to grow Potatoes successfully and produce a supply which would be of great value both to the Cameroons and Nigeria. It might be found possible with careful selection to grow a strain of potatoes without the necessity of getting out fresh 'seed' from home, but experiments, which should certainly be undertaken, will be needed in order to see how far this may be possible.

It also appears probable that at higher elevations—5000 to 6000 feet—in the Bimenda region the experimental cultivation of wheat might be undertaken. It would also be desirable to establish a low country station in connection with the cultiva-

* *See* Deistel, Government Gardener, Tropenpflanzer Oct. 1905, No. 10, where particulars of the sources of these plants are given.

tion of the Sugar Cane and the Banana for which there is a large tract of low lying ground available on the N. side of the Duala creeks.

The Plantations.

The Plantations are the striking feature of the British sphere of the Cameroons near the coast, stretching round the base of the mountain from near Rio del Rey to Missellele and beyond. They occupy a belt of country from sea level to about 1800 ft., only interrupted here and there by small native reserves. These plantations were the property of individuals or companies and excellent houses, drying sheds, sawmills and other offices are to be found at each centre.

Thanks to the admirable arrangements made by the Supervisor of Plantations, Mr. F. Evans, Superintendent of Agriculture, Nigeria, I was able to visit most of the principal plantations, and my tour was all the more easy owing to the convenient system of trolley lines, both double and mono-rail which exist throughout the plantations. Where trolley lines did not exist our journeys were made on horseback.

In these ways the plantations of Victoria Farms, Ekona, Moliwe, Tiko, Molyko, Debundscha and Bibundi, were visited.

It may be of interest to give a few particulars of some of these plantations :—

The Victoria farms have an area of about 42,000 acres, of which some 3300 acres are under cultivation principally with Cocoa. The soil here is rather shallow in parts, the volcanic rock being near the surface. The Cocoa on this estate showed a good deal of 'die back' and was in a less satisfactory condition than in other plantations.

Ekona has an area of about 14,000 acres, some 2843 being under cultivation with Cocoa, Hevea and Funtumia Rubber, Kola and Oil Palm. The plantation is at about 1200 ft. on the Eastern side of the Cameroon mountain and the condition of the Cocoa and Kola was very good. The soil is rich and deep. At Ekona there are excellent Cocoa drying sheds and saw mills run by electric power, &c. Here as elsewhere the Cocoa has been interplanted with Oil Palm and Rubber Trees, and the mixture, especially with the Oil Palm, is far from satisfactory. (Plate I., fig. 2.)

Moliwe, on the S.E. slopes of the mountain, is at about 1500 ft. elevation and is said to be some 37,000 acres in extent, 4465 being under cultivation in Cocoa, Rubber, Kola and Oil Palm. From the Plantation Manager's house, situated at the top of a conical hill some 500 ft. above the general level, the views over the country towards Duala on the one side and the mountain on the other are very striking.

The Tiko & Woermann Estates are mainly on the level ground by the creeks of the Mungo river and are reputed to have an area of 30,150 acres, of which 2600 are said to have been planted.

Bananas and Plantains are the principal crop and the main outlet was by water from the Tiko wharf. It was from the pier, made of cast iron piles, 115 metres long, that the s.s. "Moewe" used to set out loaded with Bananas for Hamburg. Here also there is a Banana-drying shed and a saw mill.

At *Missellele*, which I was unable to visit, Coffee is one of the principal crops.

The *Molyko* concession on the S. slopes of the mountain is some 42,000 acres in extent, about 3000 being under cultivation. Its elevation is from 1500–1800 ft. and Cocoa is the principal crop.

Debundscha and *Bibundi* lie on the W. slopes of the mountain and are mainly at low elevations. *Debundscha* is noted for its excessive rainfall, as much as from 550–600 inches in the year having been recorded. *Bibundi*, lying beyond to the North, also enjoys a heavy rainfall. Here a rotary Cocoa dryer had been installed and the saw mills and plantation offices generally were on an elaborate scale. An avenue of Avocado pears some 3 miles long had also been made through the plantation, which is mainly Cocoa, and the trees laden with ripe fruits were in excellent condition.

From this brief account of these extensive plantations it will be seen that they are likely to provide pathological and other problems needing scientific investigation and research, far more than is the case in Nigeria proper, where plantations are on a relatively small scale.

It is to be hoped that with the restoration of the Victoria Gardens, it may be found possible to establish there a department of plant pathology, so that expert scientific advice will be available and investigations may be undertaken upon the various diseases from which large plantations are liable to suffer, and combative remedies may be suggested.

The necessary laboratories, where work of this kind can be carried out, are already in existence, and the past history of disease in large plantations may be cited in evidence of the urgent need of scientific investigation and control under artificial plantation conditions. Not only is there the constant menace of disease when large areas in the Tropics are devoted to the cultivation of one particular economic product such as Cacao, Hevea rubber, Coffee, &c., but there are other fields of research which it is most desirable to explore.

Of paramount importance, as has recently been demonstrated in Malaya, is the finding of the most economically useful varieties for cultivation. This may be done either by selection or by breeding or by a combination of both methods, and entails accurate scientific knowledge and usually much patient research. On work of this kind, however, depends very largely the commercial success of some particular economic product grown either as a crop or under plantation conditions, and the useful work that has been done in the Northern Provinces, Nigeria, in

selecting Cotton for length of staple may be adduced in evidence of the value of such work.

Soil questions also open up a wide field of research, as it is not uncommon to find that plantations or some portions of them have been made where the soil is not suitable for a particular plant and disease manifests itself because of such unfavourable conditions. The primary cause of the trouble being bad conditions and not the fungus or insect pest which is the obvious result.

In addition to research, instruction should also be an important function of a Tropical Botanic Garden, for intelligent labour both in the Garden itself and in the plantations is essential to success and progress.

In no place can such instruction be better given than in a Botanic Garden, especially to boys and young men, since they can become acquainted with all the important economic plants and acquire a sound practical knowledge of their culture and methods of propagation in the course of their ordinary duties, and on this can be built up a theoretical knowledge by means of lectures and demonstrations.

A properly equipped Botanic Garden can thus play a very important and most essential part in a colony whose welfare depends largely on the success of plantation enterprises, and it is to be hoped that the Victoria Gardens will fill this rôle when they have been restored and are maintained in a state of efficiency.

Nigeria.

Nigeria offers many striking contrasts to the British sphere of the Cameroons, both as regards its physical features and the methods of cultivation employed. In the Cameroons the soil is for the most part fertile and consists of decomposed volcanic rock with an abundant water supply.

In Nigeria, the soil is mainly laterite with granitic rocks in the Northern Territories, and not only is the water supply very poor, but in the Northern territories there is a dry season of some 6–7 months which seriously hampers agricultural operations.

In Nigeria too the land is mainly in native hands and the native plots under cultivation with such introduced products as Cacao, Rubber, American Cotton, &c., are relatively small and separated from one another by broad belts of bush.

Fungoid diseases, therefore, though often present owing to faulty planting or to unsuitable conditions, are not able to spread far and wide, as they can under an extensive plantation system and remedies when suggested are as a rule not adopted owing to the ignorance or indifference of the native cultivators.

Such conditions thus minimise to some extent the need of skilled scientific workers, though they may still find much to do in investigating the causes of disease. Any control work that may be needed should come well within the competence of the itinerant agricultural officers.

Botanic Gardens and Plantations.

The oldest surviving Botanic Garden or Botanic Station in Nigeria is that at Calabar. This is well situated and planted with a useful collection of exotic economic products, which are much the same as those at Victoria. The natural beauty of the site and the soil, however, are not to be compared with the Cameroons Garden.

In the experimental grounds attached to the Garden are examples of all the useful Tropical products suitable for cultivation in the province, and from the plants grown it may be seen what could be cultivated with profit to the community. As an instance the Sugar Cane may be cited. This is growing well and it seemed likely that much ground near Calabar might be put under sugar cultivation. The necessary enterprise, however, seems to be lacking and instead of growing and making sugar around Calabar the whole of the sugar consumed in the Colony is imported into the country.

A small and practically useless sugar plant has been set up in the station, but it seems hardly the function of the Agricultural Department to demonstrate that sugar can be made from Sugar Cane, but rather that it is possible to grow the raw material.

There is a tendency with Botanic Gardens in the Tropics, noticeable to some extent in Nigeria, to regard them as places where fruit and vegetables should be grown for the benefit of the white community. That they should serve as instructional centres for disseminating knowledge about the possibilities of growing such useful products is legitimate, but the cultivation of such products on a commercial scale, as also in the case of sugar, should be entrusted to private enterprise. Such private enterprise, however, should be stimulated and encouraged as far as possible by the Agricultural authorities. In the Federated Malay States market gardening enterprise has been successfully undertaken by the Chinese, and it would seem possible, from what one saw in N. Nigeria, gradually to encourage the W. African native to take up the growing of vegetables for market, as a commercial venture.

The Botanic Stations should also be prepared to propagate and distribute the most suitable varieties of economic plants for cultivation, and this function was being well performed by the Gardens and Plantations in Nigeria.

The other Stations and Plantations visited were those at Agege, near Lagos; Ibadan, the headquarters of the Agricultural Department, Southern Provinces; Kaduna, the headquarters for the Northern Provinces and the experimental station at Maigana near Zaria.

The time at my disposal unfortunately did not allow of a visit being paid to Onitsha or to Ilorin, where useful work has been done in the selection of Tobacco and Cotton suitable for cultivation in that district.

Southern Provinces.

At Agege, *Cacao*, *Hevea* and *Kola* were being grown, and there is a small Cocoa-drying and fermenting plant as well as a rubber shed. The plantation, though small, ought to serve a useful purpose as a Demonstration Centre, but owing to the small staff of the Agricultural Department it can only be visited at rare intervals by an official, and the work has to be left in charge of a native overseer.

It was clear from what could be seen at Agege and at Ibadan that the cultivation of *Hevea brasiliensis* by small holders is not likely to prove a financial success. The tree grows well and appears to be free from serious fungus disease, but it is eminently a product for growing under plantation conditions. Unless therefore a system of co-operation among neighbouring small holders owning fairly large areas of Hevea can be established, the cultivation of this tree by small native landowners appears to be a wasteful diversion of their proper agricultural activities.

The prevalence of the Oil Palm is the remarkable feature in the landscape throughout the greater part of Southern Nigeria; here and there a few *Raphia* and *Borassus* Palms can be seen, but with these exceptions the great belts of pure Oil Palm dominate the scenery.

It was obvious that it would be futile to attempt to replace the vast numbers of indigenous Oil Palms by any better-yielding varieties which might be raised at an Experimental Station, however desirable it may be to produce a strain yielding a higher percentage and a better type of pericarp and kernel oil.

Moor Plantation at Ibadan, where the headquarters and Laboratories of the Agricultural Department (Southern Provinces) and the residences of the principal officers are situated, is a far more ambitious undertaking and one from which the Colony should derive a great amount of benefit. Whether it has fully fulfilled its functions in the past may be open to question, but that it should be able to play a very important rôle in the development and progress of Nigerian Agriculture in the future cannot be doubted.

Here experiments have been conducted on the cultivation of Coconuts, Ceara Rubber, *Cacao*, Oil Palms, Abeokuta Coffee, *Kola*, Teak, Mahogany, *Cedrela*, native *Phaseolus* for green manuring, &c.; while in a large orchard plot Citrus trees in variety, Bananas, Pineapples and various Tropical fruit trees are under cultivation, which serve as a useful demonstration of the edible fruit trees likely to succeed in Southern Nigeria. The nurseries for the propagation of useful economic and ornamental plants are well arranged and well stocked with good young plants for distribution. Experiments were also in progress in fallowing the ground, green manuring, etc., which should lead to useful results.

In two directions, however, it seemed that there was a great and pressing need for investigation and research, and the same remarks apply both to the Northern and to the Southern Territories. In the first place, very little, if anything, is known about the bacterial flora of the soil and of the effect on the soil of the burning tropical sun and the long dry season. Further, the universal native practice is to burn down the grass and bushes covering the ground before any attempt is made to till the soil. What effect has this annual burning on the soil and its organisms? Is it harmful or beneficial? It may be that noxious insects and fungi are killed in the process. But may there not at the same time be a loss of valuable chemical substances from the soil owing to the roasting of the ground by the fierce heat of these bush fires?

Then, too, the peculiar native methods of cultivation, primitive as no doubt they are, may and probably have underlying them some scientific principles of value, though they have been developed empirically by the natives as the result of long years of experience.

Such conditions and our lack of definite knowledge suggest the urgent need of appointing Agricultural Chemists, well versed in the science of soil biology, to discover what underlying principles there may be in native practices and also, if they are found to be of value, to develope them and gradually to improve the methods of cultivation suitable to the country.

The need of Agricultural Chemists has been fully realised by His Excellency the Governor in his despatches and in his Address to the Nigerian Council (p. 182), and it is to be hoped that this much-needed line of enquiry will soon be undertaken.

The other direction in which there is an extensive field for useful investigation is that embraced in the term Economic Botany in its widest sense. Very little, it appeared, is known of the plants used by the natives for food and for other purposes, reliance being placed by the European officials on products with which they are familiar at home. Thus many native plants, which would be of undoubted service to the white community as edible vegetables or for other purposes, are disregarded and opportunities of promoting the health both of the white and native population are sadly neglected. Many of these native plants would doubtless be found susceptible to improvement by selection or hybridisation, and I am convinced that a far-reaching benefit would be conferred were Economic Botanists appointed in the Agricultural Department, whose prime duty it would be to investigate as fully as possible the native economic products and demonstrate their value for the good of the community.

Up to the present the activities of the Agricultural Department have largely been centred in the introduction of exotic plants of economic importance to the neglect of the study of

native plants likely to be useful for food, green manuring and the like. It is to be hoped therefore that this state of affairs will soon be remedied and a careful survey of the native flora will be initiated by competent Economic Botanists.

At Ibadan, agricultural instruction has been given to a certain number of native youths, but I doubt if the scheme has been given a proper chance of success. In order to inculcate an interest in the sciences of Horticulture and Agriculture, training should begin in the Elementary Schools. With a community like that of Nigeria, where Agriculture is the dominant industry, the training of the children in the elements of Horticulture and Agriculture should be commenced by means of properly organised school gardens.

The syllabus of Agricultural Training in the Education Code of Nigeria provides for the instruction of children by the growing of such exotic plants as Para Rubber, Cocoa and Coffee, and neglects those native plants, familiar to the children, which are of economic value. At present, therefore, it seemed that very little good was being done in this direction and that there was a great need for better methods.

It should be arranged for the school gardens, in which *annual* native and exotic plants ought to be grown, to be inspected regularly by officers of the Agricultural Department. The teachers should also be given lectures at the Agricultural Experimental Stations, and an early interest should thus be promoted and a real education given in a subject on which the prosperity of the country so largely depends.

After this preliminary introduction it would be possible to select a certain number of the more intelligent pupils and train them further at the Experimental Stations. In due course such scientifically trained boys should become competent farmers and agricultural inspectors and so serve to disseminate better farming methods throughout the country.

The proper training of such boys necessitates the appointment of well-equipped permanent Curators of the Stations, who should be competent not only to supervise the accurate conduct of the scientific experiments, but also to impart instruction to the pupils.

The formation of local Agricultural Societies is another method of interesting the native farmers in the scientific principles underlying agricultural practice, and also of enabling the Agricultural Department to get in touch with and gain the confidence of the farmers.

I was impressed very forcibly by the fact that there was much to be learnt from a careful study of native farming methods, both in the Northern and in the Southern Territories, and that the surest way of discovering what may be of value and of inducing the natives to adopt improved methods is to gain their confidence and impress on them that it is only by their co-operation and help that agricultural progress can be achieved.

Northern Provinces.

The activities of the Agricultural Department in the Northern Provinces have been fruitful in several directions. In the first place the Kaduna roadsides have been planted with flowering trees, which even now are forming avenues of considerable interest and beauty. Secondly, it has stimulated vegetable and flower gardening, etc., and as a result the Kaduna Horticultural Society is a flourishing association of keen gardeners, while at the Ilorin and Maigana Plantations useful work is being carried out on the selection of Cotton, Maize, Ground Nuts, Guinea Corn, Tobacco and other Economic Products. A brief account of the tree planting at Kaduna and of the Botanic Station has been given in the Annual Reports of the Department for 1914 and 1915 (see *Kew Bull.* 1917, p. 30). The site of the Station on the bank of the Kaduna river is a beautiful one, but it is at present a purely economic garden and is not laid out as an ornamental pleasaunce. Nor is it near enough to the town of Kaduna to make this very desirable.

There is a very good collection of useful fruit trees, and vegetables of all kinds are being grown there with great success. In the dry season such cultivation is only possible with irrigation, and this is regularly practised. With the river alongside, there is plenty of water, but during the dry season the level of the river is so far below the garden level that the lifting of the water presents considerable difficulty.

Owing to the dryness of the air in the dry season and the heat of the sun, not only vegetables but also pineapples have to be grown under a light shade, and it is also necessary to protect the bunches of Bananas with straw in order that they may ripen properly and not dry up on the plant. It was of interest to learn that potatoes have been successfully cultivated and that, as I was able to see, the tubers will keep well if stored in a shaded pit with wood ashes and covered with dry grass.

The fields at Maigana plantation were naturally all bare and fallow at the time of my visit, but the results of the cotton and other selections were examined in the sheds. It was of interest to see examples of the longer stapled Allen's cotton which have been gradually selected at the Experiment Station, and it is hoped gradually to replace the inferior strains now grown by the native cultivators with the best strains selected at Maigana, and so increase very largely the value of the cotton output for the Northern Provinces.

Vegetable growing, and also the cultivation of onions, sugar-cane and calabashes is practised by the natives in N. Nigeria to a considerable extent, and the onion crop is usually very good; the native method of watering by means of a "shadoof" and then running the water so lifted along channels is very practical and inexpensive and might well be developed to advantage.

With a simple system of lifting the water as used by the

Hausa cultivators, and terracing of the garden ground, it should be possible to irrigate by gravitation considerable tracts of suitable land along the banks of streams and rivers.

It would seem that if this native system of cultivation could be encouraged a large supply of useful vegetables could be raised by market-gardening natives which would be of great benefit to the country.

.The Agricultural Department could also assist the market gardening enterprise by assisting with the selection of suitable seeds, and with regard to onions especially, they might help greatly by selecting a strain of non-bolting Nigerian varieties. It was noticed in one native garden that quite 50 per cent. of the onions grown from native seed were running to seed without forming bulbs, and this state of affairs could easily be remedied by scientific assistance.

It is realised, however, that valuable work of this kind will not be possible until the Agricultural Department has its full complement of scientific officers.

The problems to be faced in the cultivation of vegetables and flowers under the arid conditions of N. Nigeria have been very successfully surmounted at Sokoto, where the influence of the neighbouring desert is far more potent than at Zaria or Kaduna.

Dr. Bernard Moiser, Senior medical officer, Sokoto, has achieved a remarkable success under very adverse conditions with his garden at Sokoto, and to my great regret time did not permit of my paying it a visit.

The garden has been well described in the current number of the Journal of the Royal Horticultural Society,* and both the successes and failures are recorded, thus making the account of permanent value. Dr. Moiser has, in effect, established a small Botanic Garden of considerable educational value, which is a veritable oasis in the midst of dry and cheerless surroundings, and it is to be hoped that the Government of Nigeria will be able to arrange for its permament maintenance should the Founder be transferred to some other sphere of activity.

Horticultural enterprise in Nigeria owes a further debt to Dr.Moiser for his pamphlet on Gardening in the Northern Provinces, published by the Kaduna Horticultural Society, which has been of great value to the members of that enterprising and useful body, and has evidently stimulated a keen interest in gardening in Kaduna and the neighbourhood.

It was unfortunate that the time of my visit to Nigeria coincided with the close of the dry season so that it was not possible to see any agricultural operations in active progress.

The fields in the Northern region were all bare and dry and the soil had been hoed into long broad furrows. The cultivation

* "Pioneer Work in Nigeria: The Sokoto Gardens," by Mrs. R. Lamartine Yates; Journal of the Royal Horticultural Society, Vol. XLVI, May, 1921, pp. 336–345, with Plates.

here is good, and the appearance of the ground suggests spade or even plough work, whereas a back-breaking form of hoe is the sole native tool. This in shape is similar to the tool referred to by Mr. M. T. Dawe in his recently published report on agricultural conditions in the Gambia*.

It is possible that in some parts where the land is open, and there are no "Doka" and other bushes, that a plough might be used with advantage, as Mr. Dawe suggests for parts of the Gambia, but the native is so proficient with his hoe, and has so little knowledge as yet of other implements, that little good can be expected for some years from the introduction of either animal-drawn or motor ploughs with which he is unfamiliar.

In the Southern Provinces there would appear to be practically no scope for a plough of any kind as the cultivated plots are usually small and widely scattered.

In Northern Nigeria, as I have mentioned, there is no lack of animal manure, and the common practice is to turn the herds of Fulani-owned cattle on to the fallow fields during the dry season at night time. In this way the tilled ground receives a good supply of manure, but as the droppings are exposed to the sun's heat, and no attempt is made to cover the droppings by turning them into the soil, it seems probable that a great deal of their fertilising value must be lost.

Owing to the dry and baked condition of the ground the conservation of the manure is no easy matter and some radical change in tillage methods may be needed in order that the full benefit may be obtained. Should it be found possible to cover and spread the manure by some form of light harrowing, it would probably lead to an increased fertility of the soil. Before any such radical alterations in native procedure can be advocated however, it will be necessary to subject them to careful investigation and experiment at one or more of the experiment stations or plantations.

Another direction in which useful results could not fail to be realised is irrigation, but this naturally is dependent on the availability of water. Wherever possible the native methods of irrigation should be improved and extended, and the ground in the neighbourhood of water should be terraced so that the largest possible area may be brought under irrigation and devoted to the cultivation of vegetable and other food crops.

The Bauchi Plateau.

One of the most interesting parts of my tour in Nigeria was the visit I was able to pay to the Bauchi Plateau. As there were no specimens in the Kew Herbarium from this region I was anxious to pay a visit in order to meet those who might be sufficiently interested in the Flora to make collections for Kew.

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* Report on the agricultural conditions and needs of the Gambia by M. T. Dawe, Crown Agent for the Colonies, 1921, p. 41.

His Excellency the Governor having kindly granted me permission to extend my tour to visit the Plateau, I spent some interesting days around Jos in the company of the Director of Agriculture, N. Provinces, and was very gratified to find several people who were willing to assist us in sending home specimens.

The journey from Zaria to Jos is about 132 miles and the train climbs slowly the 2000 ft., the greater part of the ascent being towards the end of the journey. The time taken was about eleven hours, and, as there is a passenger train only once a week, the journey both up and down was made in one of the large covered luggage vans attached to the daily goods train leaving Zaria at 7.15 a.m.

The scenery throughout the Zaria province is somewhat monotonous; dry savannah or sparse park-like vegetation, the dominant plant being the "Doka" (*Isoberlinia doka*), which, despite the dryness, was coming into fresh leaf everywhere. Other conspicuous trees were *Parkia filicoides* and Shea butter, while the shrubs were mainly *Anona senegalensis*, Combretums and Acacias. (Plate III., fig. 6.)

The ground in many places was studded with the large yellow flowers of *Cochlospermum tinctorium*, Rich. (*Bixaceae*), and the conical red earth ant heaps were a conspicuous feature

Around the villages large areas are devoted to cultivation and here the *Parkia* trees are carefully preserved by the natives, as their leaves are used as green manure.

The effects of the burning of the bush and old grass, to encourage young growth, were much in evidence, and it was remarkable to notice how little the "Doka" and other bushes and trees were injured by the fierce heat of these annual bush fires.

On the plateau the aridity of the country, at the end of the dry season of some seven months, was very striking, so that the number of plants that were in flower or were bursting into fresh green leaf was all the more remarkable. The problem of the water supply is worthy of investigation as the ground appeared to be quite dry though the water table must, it would seem, be fairly near the surface. The bare granitic hills which crop out around Jos and Naraguta add to the general dry and barren effect of the landscape.

These dry granitic hills are the home of many xerophytic plants of interest, but unfortunately the Cactoid Euphorbias (Plate III., fig. 5), and Asclepiads with their stout grey stems were not in flower. Here also was growing a white-flowered leafless *Senecio* with the habit of a xerophytic Euphorbia, which has proved to be a new species and has been named *S. Cliffordianus*, in honour of His Excellency the Governor.

Other plants found among the dry rocks were a *Sansevieria*, an *Aloe* in seed, living specimens of both of which were brought home to Kew, and *Strophanthus sarmentosus*.

The Pagan villages, consisting of clusters of small round mud houses, are to be found among the rocky hills, and are surrounded,

Plate III.

FIG. 6.

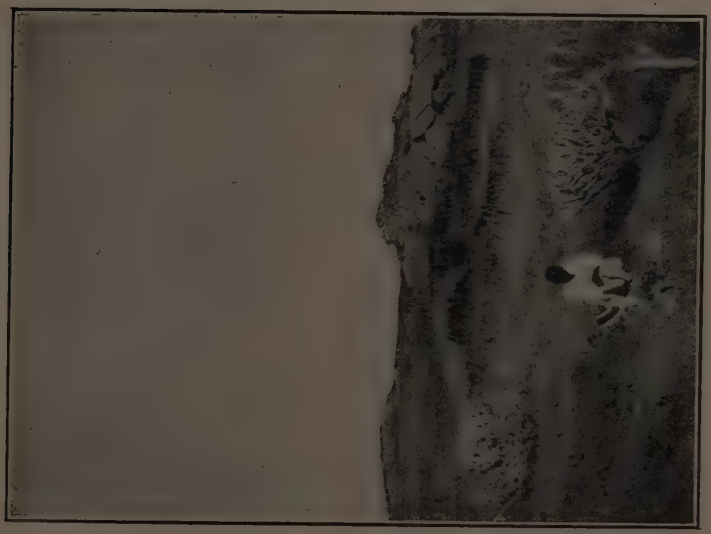

FIG 5.

[*To face page* 240.

Plate IV.

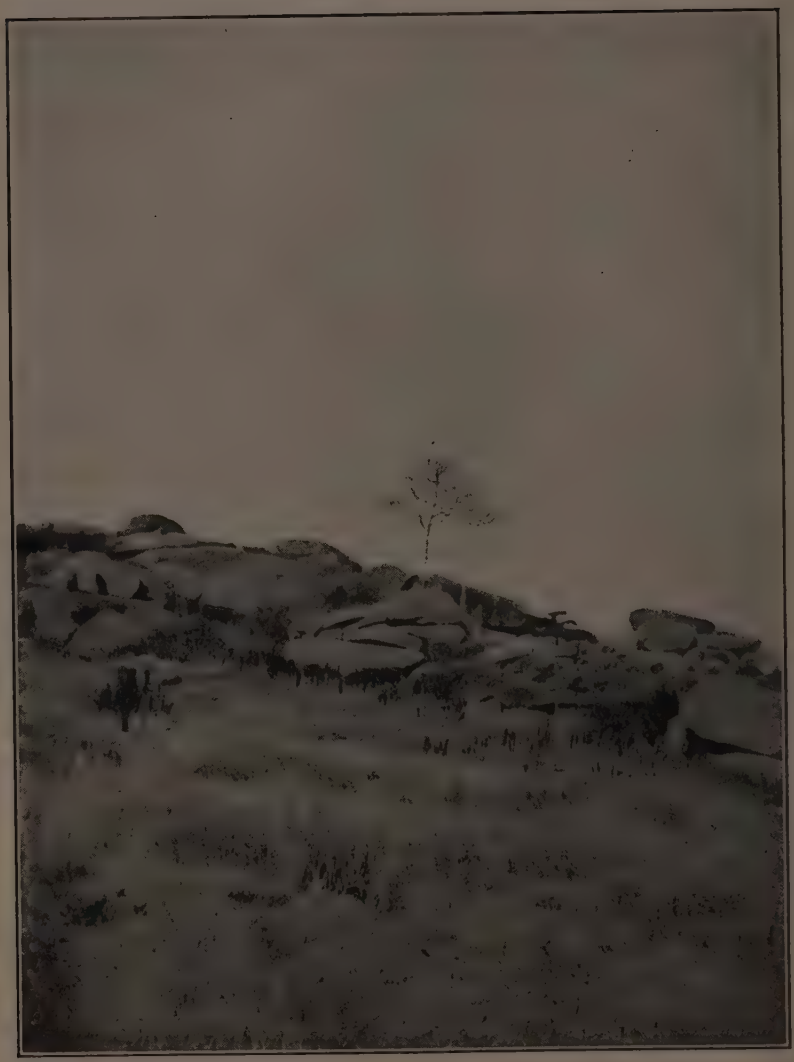

Fig. 7.

To face page 241.]

as are also their small fields, with a close and impenetrable stockade of columnar Euphorbias. (Plate IV., fig. 7.)

Despite the dryness some eight new species of flowering plants were collected, and if this could be done in the course of a three days' visit at the end of the dry season, it is obvious that there must be a considerable number of plants on the plateau of which as yet we have no knowledge.

It is hoped therefore that others may be stimulated to collect, and so add to our knowledge of the Flora of the plateau and of the Northern Provinces generally.*

I had the good fortune to meet several managers of the various mining companies engaged in the Tin-mining Industry, and was pleased to see how keenly interested they were in making beautiful and useful gardens. As might be expected flowers familiar to them at home were their chief concern, but they had often collected native plants, and several interesting species were to be seen flowering in their gardens.

Among these *Mussaenda arcuata*, Poir., in Mr. Bourke's garden at Naraguta, which grows wild near by, promises to be an ornamental plant worthy of cultivation. Equally, or even more beautiful, would be the new species of *Ochna* (*see* p. 241), which I had the good fortune to discover, *Feretia canthioides*, Hiern, *Lonchocarpus seriseus*, H.B.K., and many other indigenous native trees and shrubs of great beauty, which do not as yet appear to have been subjected to cultivation.

A white-flowered *Ochna*, and a few other interesting native plants were being grown in Col. H. W. Laws' charming garden at Tudun-Wada near Jos.

Attempts have naturally been made in the Plateau gardens to grow apples, grapes and strawberries, etc., but unfortunately, owing to the unsuitable nature of the climate, no great measure of success has attended the care and trouble which has been bestowed upon them. A blackberry was growing well and fruiting in Mr. Bourke's garden.

Both on the Plateau and in Nigeria generally it was interesting to find how keen the desire of the majority of the officials and traders was to establish gardens for use and beauty around their homes, and in many cases they were only waiting for advice and instruction to enable them to realise their aspirations. To all such would-be gardeners the pioneer work of Dr. Moiser at Sokoto should give encouragement and hope.

Conclusion.

My visit to the Plateau concluded my tour in Nigeria, and it was with great regret that I had to turn my steps homeward without having been able to see more of the country. Even

* Since my return, Mr. H. V. Lely, Forest Officer at Naraguta, has sent about 350 excellent dried specimens from the plateau. A few were already represented in my own collection (*see* Article XXIX.), and all are of great interest and value.

as it was, however, I was able to cover a considerable amount of the Protectorate and see something of the different types of country and study the various problems they present. For the interest and value to myself of the whole tour in the Cameroons and Nigeria my thanks are due, in the first place, to His Excellency Sir Hugh Clifford, not only for the welcome he gave me, but more especially for the kind arrangements he made, through the officers of the Government of Nigeria, for the successful accomplishment of my objects.

To the Supervisor of Plantations, Cameroons, Mr. F. Evans; the Acting Director of Agriculture. Southern Provinces, Mr. A. H. Kirby; the Director of Agriculture, Northern Provinces, Mr. P. H. Lamb, and his Superintendent, Mr. K. T. Rae, I am particularly indebted for all the help and assistance they gave me, and for their kindness in making it possible for me to see as much as possible of the country, and learn something of its agricultural possibilities and of the difficulties with which they have to contend.

Nor should I omit to record my indebtedness to the Residents and other political officers with whom it was my good fortune to come in close personal contact. The list of these would be unduly long, but, as in private duty bound, I must mention Captain G. Anderson, Resident, Cameroons, Mr. R. A. Hargrove, Resident, Calabar Province, and Captain W. A. Ross, Resident, Oyo Province, who were at special pains to make my tour of the greatest possible value.

To Captain Ross, whose knowledge of the Yoruba country and sympathy with its peoples has been gained by a long residence in their midst, I am particularly indebted. Thanks to his kindness I was able to see the country from Ibadan to Oyo and Iseyin, and to gain a far more intimate knowledge of the Yorubas, their arts and their industries than would otherwise have been possible. That these people are imbued with a strong artistic feeling and with a high degree of intelligence, which is also the case with the Hausas of the north, was clearly evident.

This is no doubt true also with regard to some other of the native races of Nigeria with whom I was not able to come in contact. As to their artistic qualities the beauty of the native cloths woven and dyed with the native indigo (*Lonchocarpus*), in the Yoruba country, the basket and mat making at Oyo, Iseyin, Bida, etc. the native pottery, made entirely without a potter's wheel, perfectly formed and finished with a singular sense of grace and proportion, may be cited in evidence.

That this is the case augurs well for the future development and progress of the country, especially in matters agricultural, and leads me to repeat what I have said earlier that success in promoting the agricultural prosperity of Nigeria will depend very largely on our appreciation of the fact that their knowledge, based as it is on long years of hard-won experience, is worthy of careful study.

Our duty, as it appears to me, is first to learn whatever there may be of value in native agricultural methods, and then, having estimated their worth, to endeavour to improve upon them with the aid of scientific research, so that they can be recommended for adoption in confident assurance that the native agriculturists will co-operate and apply them.

It is apt to be forgotten that the native races have had insufficient time to adapt themselves to the new conditions introduced with the British administration, or to acquire the knowledge which it has taken the European centuries to assimilate.

We forget possibly, in our endeavours to impart information, how elementary that instruction must be at the start in order that it may be properly grasped and appreciated. In matters agricultural, I feel convinced that for real progress to be ensured, not only must our instruction be given on lines adapted to meet the needs of a primitive community, but it must be begun with the children themselves. This can best be done by means of a carefully thought out system of elementary education, based very largely on the principles and practice of gardening and horticulture.

Before we can venture to assume the rôle of teachers in matters agricultural, however, we have much to learn about the methods employed by the native cultivators themselves, and the more we may be able to unravel and elucidate the underlying scientific basis of their practices, so much the more shall we be able to encourage them to adopt the improvements which may be discovered to be applicable to the peculiar conditions of the country.

Explanation of Plates.

Plate I.

Fig. 1.—Ekona, Cameroons. A Cocoa plantation with Oil Palms; the Cameroon Mountain is seen in the distance.

Fig. 2.—Victoria Botanic Gardens, the Limbe river and Palms.

Plate II.

Fig. 3.—Buea, Cameroons. Tea bushes about 15 ft. high.

Fig. 4.—Cinchona trees at Buea.

Plate III.

Fig. 5.—Granitic hills near Jos, Northern Nigeria, with bushes of a Cactoid Euphorbia.

Fig. 6.—Buin Yaro on the railway from Zaria to Jos. Natives making grass mats for thatching their circular mud houses. The tall tree is *Parkia filicoides*.

Plate IV.

Fig. 7.—Granitic hills near Jos with a Pagan village among the rocks. A close stockade of columnar Euphorbias surrounds the compound.

XXIX.—LIST OF PLANTS COLLECTED IN NORTHERN NIGERIA BY CAPTAIN A. W. HILL, 1921.

J. Hutchinson.

The flora of Northern Nigeria was first made known to us by Dr. Theodor Vogel, the botanist accompanying the British expedition to the Niger under the command of Captain Trotter in 1841. His collections formed the basis of Bentham & Hooker's *Niger Flora*, edited by Sir William Hooker and published in 1849. Nearly twenty years later one of the finest collections ever brought from Tropical Africa was made in Nigeria by Mr. Charles Barter, attached to the Niger Expedition under Dr. Baikie. Many of Barter's plants were gathered in the Nupé district of Northern Nigeria, and they have mostly been described in the Flora of Tropical Africa and other works.

It was not until about the year 1904 that plant collecting in Northern Nigeria was resumed, and since then Kew has continued to receive a considerable number of dried specimens, mainly from officers attached to the Forestry and Agricultural departments, and also from medical officers. Chief amongst the latter is a finely preserved collection begun by Dr. J. M. Dalziel in 1906 and received through the Imperial Institute. From the determinations made at Kew Dr. Dalziel compiled his most useful *Hausa Botanical Vocabulary*, published in 1916. There are still a number of Dr Dalziel's plants to be finally worked out, and one or two, together with a few collected by Mr. H. V. Lely, Forestry Officer, Northern Nigeria, are made co-types of species described for the first time in the present paper. As Mr. Lely's investigations are still being energetically continued, however, his plants will form the basis of a separate memoir as his material accumulates.

The present is a list of the plants collected in Northern Nigeria in March 1921 by the Assistant Director, who has supplied the following particulars and notes to some of the descriptions. The collection consists of some 35 specimens gathered round Jos and Naraguta on the Bauchi Plateau, chiefly among the dry granitic hills, at an elevation of about 4,000 ft. Though it was the close of the long dry season the number of plants in flower was remarkable and in the short time available only comparatively few of the plants in flower were collected. Of the other plants, some 20 in number, the majority came from Zaria and Maigana about 15 miles from Zaria. Here the elevation is about 2,000 ft., and the soil is either laterite or granitic. As on the Plateau, the ground was very hard and dry since there had been no rain for about six months. A few plants were also found at Kaduna. Seeds of several plants were brought home and some of these have germinated, and may prove to be of horticultural interest. The new species of *Ochna* is a plant

of singular beauty, and the *Vigna* is also attractive with its large lavender-violet flowers which are very sweet-scented.

Bixaceae.

Cochlospermum tinctorium, *Rich.*; Fl. Trop. Afr. i. 113.
Naraguta, 21 March, No. 24; Kaduna, 18 March, No. 50.
A common low growing savannah plant of Upper Guinea, defoliate at flowering time, and ranging from the north bank of the Gambia to the hinterland of Lagos and Northern Nigeria. Common in Nigeria, the large orange-yellow flowers studding the dry ground, being very conspicuous and beautiful; roots yield yellow dye used for dyeing thread yellow in Hausa country. Hausa "Turri."

Polygalaceae.

Securidaca longipedunculata, *Fres.*; F.T.A. i. 134.
Jos, 21 March, No. 1, also seen at Maigana and Zaria; shrub 6–10 ft.
One of the commonest and most widely-spread African shrubs, ranging over the whole of Tropical Africa, and well adapted by its samaroid fruits for distribution by the wind. It extends southwards to Delagoa Bay, the northern Transvaal and Amboland, S.W. Africa. A very beautiful shrub with sweet scented flowers which should be cultivated in gardens in N. Nigeria.

Malvaceae.

Cienfuegosia heteroclada, *Sprague* in Kew Bull. 1907, 48.
Naraguta, 22 March, on ground recently burnt, No. 25.
A rare plant only found in Northern Nigeria, where it appears in the bush after burning. This is the second gathering of the species, which was discovered at Kontagora by Dr. J. M. Dalziel in 1905.

Ochnaceae.

Ochna Hillii, *Hutchinson*, sp. nov. [Ochnaceae-Ochneae]; affinis *O. leptocladae*, Oliv., sed foliis sub anthesi partim evolutis, floribus majoribus, antheris longioribus differt.

Frutex usque ad 3 m. altus, sub anthesi fere efoliatus, laxe ramosus; caules erecti, basin versus circiter 5 mm. crassi, ramis lateralibus multifloris usque ad 10 cm. longis cinereis, labris. *Folia* matura obovato-oblanceolata vel oblanceolata, basi attenuata, apice obtusa vel fere rotundata, 9–12 cm. longa, 2–4 cm. lata, firme chartacea, margine crenato-serrulata, cartilaginea, utrinque tenuiter reticulata, glabra; costa media utrinque prominens; nervi laterales utrinsecus 12–14, basales ascendentes, superiores arcuati et ramosi, utrinque straminei et prominentes; petioli 3–4 mm. longi, marginibus acutis cartilagineis; stipulae mox deciduae, oblongo-lineares, apice rotundatae, 0·7–1 cm.

longae, membranceae, apice interdum bifidae, glabrae. *Flores* in ramis annotinis fasciculati, 4–5-nati, flavi; pedicelli 1·5–2 cm. longi, graciles, basi articulati, glabri. *Sepala* oblongo-elliptica, apice rotundata, 6 mm. longa, 4 mm. lata, viridia, multinervosa, glabra. *Petala* obovata, vix unguiculata, 1 cm. longa, 5 mm. lata. *Filamenta* antheris longiora; antherae 2·5 mm. longae, rimis dehiscentes. *Carpella* 6, glabra; stylus 6 mm. longus. *Fructus* bicarpellatus, calyce persistente accrescente coccineo cinctus, carpellis subglobosis nigris nitidis usque ad 0·8 cm. diametro.

Tropical Africa. Northern Nigeria: Jos, among very dry granite rocks, fls & fr., 20 Mar. 1921, *Maigana* fr. 30 Mar. *A. W. Hill* 2. Kontagora, shrub in open bush, scarce, fls. & fr., *J. M. Dalziel* 97, 380; Nupe; Jeba, *Barter* 1029.

This species is most closely related to *Ochna leptoclada*, Oliv., a short slender stemmed undershrub with a wide range in South Tropical Africa, from the lower Zambesi basin to Angola. The shrub is of great beauty, the leafless twigs being covered with a profusion of clear nankin-yellow flowers about the size of Plum blossom. It is also a beautiful sight in the fruiting condition when the black carpels are conspicuous on the swollen crimson calyces. A closely allied white-flowered species was seen in the garden of Col. H. W. Laws at Tudun-Wada near Jos, and both are worthy of extensive cultivation in gardens in N. Nigeria.

Leguminosae.

Crotalaria graminicola, *Taub.* ex Baker f. in Journ. Linn. Soc. xlii. 291.

Jos. fl. & fr. 20 March, No. 3.

Also collected by Dr. Dalziel in 1906 at Kontagora, in dry bush after burning. Confined to Northern Nigeria.

Indigofera Dalzielii, *Hutchinson*, sp. nov. [Leguminosae Galegeae]; affinis *I. Schweinfurthii*, Taub., et *I. aspera*, Perr., ab illa foliis petiolatis supra glabris, ab hac foliis trifoliatis foliolis linearibus pilis brevioribus differt.

Herba e rhizomate lignoso orta, usque ad 30 cm. alta; caules erecti vel procumbentes, flexuosi, appresse pubescentes. *Folia* inferiora simplicia, superiora trifoliolata, sessilia vel brevissime petiolata; foliola linearia vel lineari-oblanceolata, acute mucronata, 2·5–6 cm. longa, 4–7 mm. lata, chartacea, supra glabra, infra appresse-albido-pubescentia, 1-nervia; stipulae lineares vel subulatae, acutae, 7–8 mm. longae, pubescentes. *Racemi* axillares, foliis multo majores, usque ad 12 cm. longi; pedunculi pubescentes; bracteae subulatae, 5 mm. longae, fere glabrae; pedicelli ad 1·5 mm. longi, pubescentes. *Calyx* subaequaliter 5-partitus, segmentis subulato-lanceolatis acutis 4 mm. longis piloso-pubescentibus. *Vexillum* rubro-purpureum, suborbiculare, circiter 4·5 mm. diametro, extra superne laxe pubescens. *Alae* et carina roseo suffusa, circiter 5 mm. longa.

Fructus reflexus, rostratus, rectus, fere 1·5 cm. longus, appresse strigoso-pubescens.

Tropical Africa. Northern Nigeria: Kontagora, in bush after burning, 7 Jan. 1906, *J. M. Dalziel* 27; Jos, 20 March, *A. W. Hill* 4; Naraguta, *H. V. Lely* 20.

Indigofera pulchra, *Vahl*; F.T.A. i. 76; Baker f. in Journ. Bot. 1903, 193.

Jos, fls. & young fr. 21 March, No. 5.

Widely distributed in North and West Tropical Africa; According to Dalziel, used with grass in thatching; vernacular "Baki-bunu."

Alysicarpus rugosus, *DC.*; F.T.A. i. 171.

Zaria, No. 36.

Sphenostylis Schweinfurthii, *Harms* in Engl. Bot. Jahrb. xxvi. 309.

Naraguta, fls. yellow, No. 26.

Extends from Kontagora (*Dalziel* nos. 15, 402) to the Seriba Ghattas in the South Eastern Sudan. Vernacular "Waken kurege" (*Dalziel*).

Dolichos Lelyi, *Hutchinson*, sp. nov. [Papilionaceae-Phaseoleae]; affinis *D. Schweinfurthii*, Harms, sed foliolis maturis lineari-lanceolatis acutis stipulis deciduis calyce subaequaliter lobato differt.

Caules simplices, circiter 3 dm. alti, conspicue flexuosi, plus minusve compressi et prominenter costati, pilosi vel fere glabri, internodiis 4–7 cm. longis. *Folia* sub anthesi immatura, trifoliolata, subsessilia vel breviter petiolata, foliolis subaequalibus lineari-lanceolatis basi angustatis apice acutis 13–16 cm. longis 1–2 cm. latis marginibus undulatis prominenter trinervis utrinque parce pubescentibus; petioli usque ad 1·5 cm. longi, basi tumidi; petioluli 4 mm. longi, crassi; stipulae deciduae, lanceolatae, acutae, circiter 1 cm. longae, costatae; stipellae persistentes, subulatae, 2–2·5 mm. longae. *Flores* axillares, fasiculati, 3–5-nati; pedicelli graciles, usque ad 2 cm. longi, glabri vel pilosi; bracteolae sub calyce duae, oppositae, subulatae, 1 mm. longae, glabrae. *Calyx* oblique campanulatus; tubus 5 mm. longus, glaber, lobo dorsale triangulari-lanceolato pubescente ceteris late triangularibus acutis circiter 1·5 mm. longis glabris. *Corolla* violacea, 3 cm. longa; vexillum suborbiculare, 2 cm. latum, extra minute maculatum; alae carina subaequales. *Ovarium* glabrum; stylus stramineus, basin versus incrassatus, stigmate terminale pilis violaceis circumdato. *Legumen* 5–6 cm. longum, sicco nigrum, marginibus laxe pilosis exceptis glabrum. *Semina* suborbicularia, 7 mm. lata, nitida, obscure venosa.

Tropical Africa. Northern Nigeria: Naraguta, in clumps, *H. V. Lely* 44; Naraguta, *A. W. Hill* 27.

Vigna violacea, *Hutchinson*, sp. nov. [Papilionaceae-Phaseoleae]; affinis *V. pubigerae*, Baker, et *V. Kotschyi*, Schweinf., ab

illa foliis sub anthesi partim evolutis lateraliter lobulatis, ab hac calyce majore laxe pubescente, vexillo extra glabro differt.

Caules volubiles, elongati, sub anthesi efoliati, appresse albido-pubescentes, internodiis 9–10 cm. longis. *Folia* trifoliolata, petiolata, utrinque dense appresse pilosa; foliola trilobata, lateralia brevissime petiolulata, terminalia petiolulo 0·8–1 cm. longo dense tomentoso-pubescente; stipulae oblongo-lanceolatae, subobtusae, circiter 4 mm. longae et 1·5 mm. latae, extra appresse pilosae; stipellae oblongae, 1–1·25 mm. longae, glabrescentes. *Pedunculi* elongati, demum 30 cm. longi, breviter pubescentes. *Flores* subumbellati, circiter 5–6-nati, lavendulaceo-violacei. *Calyx* oblique campanulatus, 1 cm. longis, extra parce pubescens, lobis dorsalibus subconnatis ceteris triangularibus. *Vexillum* late orbiculare, emarginatum, breviter unguiculatum, circiter 3 cm. diametro, ungue 4-appendiculato, appendiculis biseriatis rotundatis. *Alae* et carina circiter 3 cm. longae, purpureo-suffusae. *Antherae* 2 mm. longae. *Stylus* curvatus, superne unilatere dense villosus, apice semisagittatus, acutus. *Legumen* lineare, circiter 8 cm. longum, 4–5 mm. latum, dense tomentellum, basi calyce persistente cinctum. *Semina* subquadrangularia, 3–5 mm. lata, fere nigra, subnitida.

Tropical Africa. Northern Nigeria : Jos, and Teria, March 20, 23, 1921, *A. W. Hill* 6.

The flowers are a beautiful lavender-violet and very sweet scented. The sparse foliage and stems are grey-green. An attractive climber which would take the place of the Sweet Pea in N. Nigerian gardens. Plants are growing at Kew.

Dichrostachys nutans, *Benth.*; F.T.A. ii. 333.

Near Zaria, No. 37.

A very common shrub or small tree, widely spread in Africa and cultivated in most other tropical countries.

Combretaceae.

Combretum herbaceum, *Don*; Engl. Monogr. Afr. Combret 67.

Near Jos, No. 8.

A species of *Combretum* with a curious habit, the short stems arising from a woody rhizome; flowers in the dry season after grass fires. Vernacular "Taro" (*Dalziel*, Katagum). Occurs in the savannah from Sierra Leone to the eastern Chari.

Umbelliferae.

Hydrocotyle asiatica, *Linn.*; F.T.A. iii. 6.

Jos, in fields, 21 March, No. 9.

This plant mimics very closely certain species of *Geophila* (*Rubiaceae*), and especially in the fruiting stage might readily be mistaken for a species of that genus. The species is widely spread in the tropics of the Old World, and is somewhat variable according to situation. The American plant sometimes referred

to this species, however, is quite distinct. It is *H. repanda*, Pers.

RUBIACEAE.

Oldenlandia grandiflora, *Hiern*; F.T.A. iii. 57.
Zaria, 25 March, No. 38 and Maigana, No. 46.

Mussaenda arcuata, *Poir.*; F.T.A. iii. 68.

In Mr. Bourke's garden, from valley near Naraguta, No. 28. Flowers creamy-white, with orange hairs at the throat, turning brown on the second day. The enlarged petaloid sepals so characteristic of the genus are only occasionally developed in this species, which ranges from Sierra Leone across Northern Tropical Africa down the eastern part of the continent as far as the Zambesi basin. An interesting and useful garden plant.

Feretia canthioides, *Hiern*; F.T.A. iii. 116.
Near Zaria, 25 March, No. 39; bushes about 4 ft. high, flowering without leaves; flowers creamy-white, flushed with pink.

This species has been gathered in Senegambia, Northern Nigeria, and in the Central Chari region, but not, so far as we are aware, from any intermediate localities. The flowers are sweet-scented and produced in great profusion along the almost leafless shoots, and like the *Ochna* it is a very desirable plant for cultivation in gardens in the Northern Provinces.

Belonophora Morganae, *Hutchinson*, sp. nov. [Rubiaceae-Alberteae]; affinis *B. coffeoidei*, Hook. f., sed foliis lanceolato-ovatis, stipulis angustioribus, receptaculis glabris differt.

Frutex; rami floriferi subteretes, glabri, internodiis 3–4·5 cm. longis. *Folia* lanceolato-ovata, sensim acuminata, subacuta, basi subacuta vel leviter rotundata, 10–16 cm. longa, 3–6·5 cm. lata, pallide viridia, firme chartacea, glabra; nervi laterales utrinsecus 5–6, arcuato-ascendentes, infra prominuli, venis transversis laxis a costa sub angulo recto abeuntibus; petioli vix 1 cm. longi, utrinque anguste alati; stipulae interpetiolares, e basi lanceolato filiformi-subulatae, 1–1·5 cm. longae. glabrae. *Flores* axillares, 3-4-nati, subsessiles, bracteis imbricatis ovatis ciliatis subtendentibus. *Receptaculum* urceolatum, 2 mm. longum, glabrum. *Calycis* lobi imbricati, late ovati, 1·75 mm. longi et lati, coriacei, marginibus angustissime hyalinis. *Corollae tubus* cylindricus, 1 cm. longus, circiter 2 mm. crassus, glaber; lobi 5, oblique oblongo-elliptici, apice rotundati, 6–8 mm. longi, 3·5–4 mm lati, subcoriacei, obscure venosi, glabri. *Antherae* inclusae, medio corollae tubi insertae, 4·5 mm. longae. *Ovarium* 2-loculare; stylus brevis, 4·5 mm. longus, ad medium bilobus. *Fructus* non visus.

TROPICAL AFRICA. Northern Nigeria: Jos, *Mrs. Cope Morgan*. Collected by Mrs. Cope Morgan, with other plants, and sent to me on the morning I left the plateau.—A. W. H.

Pentanisia Schweinfurthii, *Hiern*; F.T.A. iii. 131.

Naraguta, low tufted herb with blue flowers, No. 29.

Widely spread in East Tropical Africa; gathered in Nigeria for the first time (also at Naraguta) by Major E. J. Lugard in 1914, who notes the flowering of the species in blazing sunshine at the driest time of the year in dry stony soil.

COMPOSITAE.

Vernonia pumila, *Kotschy et Peyr.*; F.T.A. iii. 292.

Naraguta, No. 30.

Occurs also in dry stony places in Uganda (*Speke & Grant*) and on the Bahr el Ghazal (*Broun*). A low plant about 3 inches high, leafless at the time of flowering; root-stock with long tapering tubers which no doubt conserve the food supply for the dry season.

Helichrysum Mechowianum, *Klatt* in Ann. Naturh. Hofmus. Wien, vii. 101. (*H. congolanum*, Schltr. & O. Hoffm.).

Jos, 21 March, No. 11; much resembles a *Petasites*, flowering before the leaves appear.

This species was previously recorded from Agome, Togoland, Dolo, Congo, and from Angola, so Nigeria furnishes another link in its chain of distribution. The yellow flowers are very sweet-scented.

Coreopsis Barteri, *O. & H.*; F.T.A. iii. 390.

Jos, 21 March, No. 12.

Apparently confined to Nigeria. This would form a very useful garden annual. Plants are growing at Kew from seed brought back from Jos.

Senecio baberka, *Hutchinson* in Kew Bull. 1913, 180.

Jos, 20 March, No. 13.

Senecio Cliffordianus, *Hutchinson*, sp. nov. [Compositae-Senecionideae]; affinis *S. barbertonico*, Klatt, sed capitulis plus minusve simpliciter umbellatis, caulibus per anthesin efoliatis differt.

Caulis crassus, carnosus, per anthesin efoliatus, cicatribus transverse ellipticis notatus. *Folia* squamiformia, decidua, lanceolata, basi crassa, circiter 4 mm. longa, glabra. *Pedunculi* terminales, dense umbellati, simplices vel 2–3–furcati, 2–2·5 cm. longi, glabri, sicco acute costati, bracteis linearibus paucis circiter 3·5 mm. longis ornati. *Capitula* discoidea, oblongo-cylindrica, 2·5 cm. longa, medio vix 1 cm. diametro. *Involucri bracteae* circiter 8, lineares, acutae, 1·5 cm. longae, 2·25 mm. latae, extra trisulcatae, glabrae marginibus latis membranaceis subhyalinis. *Achaenia* linearia, pluricostata, 6 mm. longa, glabra. *Pappus* albus, gracilis, usque ad 1·5 cm. longus. *Corolla* pallide flava, anguste cylindricus, apicem versus paulo ampliata; tubus 1·6 cm. longus, glaber; lobi anguste lanceolati, subobtusi, 1·5 cm. longi.

TROPICAL AFRICA. Northern Nigeria: Jos, fl. 21 Mar. 1921, *A. W. Hill* 14.

This species is named in compliment to His Excellency Sir Hugh Charles Clifford, G.C.M.G., Governor-General of Nigeria. It belongs to a small group of *Senecio* characterised by its fleshy stems and discoid, umbellate capitula. The nearest allied species is *S. barbertonicus*, Klatt, from near Bulawayo, Rhodesia, whilst there are very similar species at Cape Juby and in the Canary Islands.

Apocynaceae.

Strophanthus sarmentosus, *A.P.DC.*; F.T.A. iv. i. 180.
Jos, among granite rocks, 20 March, No. 15.
Distributed from Gambia to Old Calabar and Northern Nigeria; probably also in Uganda.

Boraginaceae.

Heliotropium strigosum, *Willd.*; F.T.A. iv. ii. 41. Jos, No. 54.

Trichodesma physaloides, *A. DC.*; F.T.A. iv. ii. 46.
Maigana, flowers pale blue, No. 47.
Widely distributed in East and South Tropical Africa; first recorded from Nigeria in 1916 by Mr. Lamb (No. 95), from Kaduna.

Convolvulaceae.

Evolvulus alsinoides, *Linn.*; F.T.A. iv. ii. 67.
Naraguta, 20 March, No. 31. Zaria, 25 March, small mauve-blue flowers, No. 40.

Ipomoea fragilis, *Choisy*; F.T.A. iv. ii. 165.
Jos, 20 March, flowers lemon yellow, No. 16.
Ranges across to Djurland in the Eastern Sudan and in the Belgian Congo.

Solanaceae.

Schwenkia americana, *Linn.*; F.T.A. iv. ii. 260.
Zaria, 18 March, No. 41.

Scrophulariaceae.

Cycnium petunioides, *Hutchinson*, sp. nov. [Scrophulariaceae-Gerardieae]; affinis *C. camporo*, Engl., sed foliis sessilibus ovatis vel ovato-lanceolatis nervis reticulatis, calyce majore differt.

Herba circiter usque ad 0·9 m. alta; caulis erectus, dense glanduloso-pilosus, internodiis 2–3·5 cm. longis. *Folia* sessilia, ovata vel ovato-lanceolata, apice subacuta, basi leviter rotundata, 3–4·5 cm. longa, 1·3–2·3 cm. lata, chartacea, obtuse et irregulariter serrata, utrinque scabrido-glandulosa; nervi laterales utrinsecus 5–6, ramosi, utrinque prominuli. *Pedunculi* supra-

axillares, 1-flori, circiter 1·3 cm. longi, glanduloso-pilosi, apice bibracteati, bracteis oppositis lanceolatis obtusis foliaceis 7–8 mm. longis 2 mm. latis. *Calyx* tubulosus, viridis; tubus 1 cm. longus, oblongo-campanulatus, glanduloso-hispidus, lobis 5 ovatis obtusis 6 mm. longis 4–5 mm. latis. *Corolla* alba; tubus 3·5 cm. longus, supra medium unilateraliter constrictus, glanduloso-pilosus; lobi 4, ovato-orbiculares, venosi, circiter 1·5 cm. longi et lati, utrinque laxe puberuli. *Stamina* 4, infra tubi medium inserta; filamenta 5–6 mm. longa, crassa; antherae 4–5 mm. longae. *Ovarium* depresso-globosum, glabrum, stylo gracile.

Tropical Africa. Northern Nigeria: Jos, 21 Mar. 1921, corolla white, *A. W. Hill* 17. Naraguta, *H. V. Lely* 17.

A handsome herbaceous plant or subshrub with conspicuous white Petunia-like flowers. It would be a useful garden plant in Northern Nigeria. The white flowers turn a deep indigo blue when fading and in the press.

Scoparia dulcis, *Linn.*; F.T.A. iv. ii. 354.
Zaria, 18 March, No. 42.

Striga lutea, *Benth.*; F.T.A. iv. ii. 409.
Kaduna, 18 March, No. 51.

Bignoniaceae.

Stereospermum Kunthianum, *Cham.*; F.T.A. iv. ii. 518.
Maigana, No. 48.

Pedalineae.

Sesamum radiatum, *Sch. & Thonn.*; F.T.A. iv. ii. 557.
Zaria, 26 March, in prison garden, fls. and fruits, No. 43.

Labiateae.

Ocimum knyanum, var. **astephanum,** *Baker*; F.T.A. v. 346.
Jos, Zaria, and Kaduna, fls. mauve, No. 18.

This plant has not been collected in Nigeria since first gathered by Barter on the Niger Expedition near Lōm, Nupe, but it was found in abundance around Kaduna and Zaria and also on the Plateau. The flowers are a beautfiful pale mauve and show considerable variations in the markings.

Orthosiphon bracteosus, *Baker*; F.T.A. v. 375.

Jos, 21 March, No. 19; terminal bracts pink after the manner of the Mediterranean *Salvia Horminum*, L.; a plant worthy of cultivation in gardens in Northern Nigeria.

Thymelaeaceae.

Lasiosiphon Kraussii, *Meisn.*; F.T.A. vi. i. 231.

Zaria, 25 March, No. 44, Naraguta No. 32, and Jos, 20 March, No. 20.

As the late Professor Pearson pointed out in the Flóra of Tropical Africa, this species is extremely variable, a fact well shown in the case of the Nigerian specimens before us, ranging from perfectly glabrous to densely hairy plants, and there is considerable range in the shape of the leaves and involucral bracts.

SANTALACEAE.

Thesium viride, *A. W. Hill*; F.T.A. vi. i. 426.
Kaduna, 18 March, No. 52.

Thesium viride, *A. W. Hill*, var. *pubescens*, var. nov., a typo ubique breviter pubescens differt.
Maigana, March 25, *A. W. Hill* 49. Sokoto Province, 12 June 1907, *J. M. Dalziel* 549.

EUPHORBIACEAE.

Euphorbia hirta, *Linn.*; F.T.A. vi. 1. 496.
Zaria, 18 March, No. 45.

Euphorbia lateriflora, *Sch. & Thonn.*; F.T.A. vi. i. 552.
Jos, 21 March, no. 21.

Lepidoturus laxiflorus, *Benth.*; F.T.A. vi. i. 913.
Naraguta, male and female fls., No. 33.

LILIACEAE.

Asparagus Pauli-Guilelmi, *Solms-Laub.*; F.T.A. vii. 428.
Jos, 21 March, no. 23; flowers sweet-scented.
Urginea indica, *Kunth*; F.T.A. vii. 540.
Naraguta, no. 35.
Urginea nigritana, *Baker*; F.T.A. vii. 542.
Naraguta, no. 34.

XXX.—MISCELLANEOUS NOTES.

SIR JOHN HARRISON.—We note with pleasure in the recently issued list of Birthday Honours the name of Professor J. B. Harrison, C.M.G., Director of Science and Agriculture, British Guiana, upon whom His Majesty has been graciously pleased to confer the honour of Knighthood.

PROFESSOR P. VAN DER BIJL.—We learn with pleasure that Mr. P. van der Bijl, M.A., F.L.S., formerly in charge of the Natal Herbarium, has been appointed Professor of Phytopathology and Mycology at the University of Stellenbosch, Union of South Africa.

J. S. J. MCCALL.—We have to record with regret the death of Mr. J. S. J. McCall, who was appointed Director of Agriculture in the Tanganyika Territory on November 14th, 1920 (*K.B.*, 1920, p. 285). Mr. McCall was previously Director of Agriculture,

Nyasaland, to which post he was appointed in July, 1908. He was on a visit to Kenya Colony to consult the Director of Agriculture, when he was suddenly taken ill at Kijabe and died in Nakaru Hospital on February 4th.

Coco-de-Mer in the Seychelles.—We are indebted to His Excellency the Governor of the Seychelles for permission to publish extracts from his letter to Kew with reference to the measures that are being taken to protect the Coco-de-Mer (*Lodoicea*) trees in the Seychelles.

This information has kindly been furnished in reply to an enquiry from Kew on the subject of the preservation of this remarkable palm. His Excellency informs us that provisions have been made in the various leases to planters, etc., to ensure the protection of the palms.

It is a matter of great satisfaction to learn that the interest and importance of the Coco-de-Mer is fully appreciated in the Seychelles, and that the Government are so effectively safeguarding this unique species.

The following paragraphs are taken from His Excellency's letter of February 19th, 1921 :—

"In the two valleys acquired by the Government about 1890, viz., Anse Marie Louise and Fond Ferdinand, there are some 3000 coco-de-mer trees of all ages. These palms grow thickly alongside two valleys which cover 40 acres of land. The two Crown lands have been leased since 1900. As the lease of Fond Ferdinand expired in 1919, a new lease was entered into at that time, by which the new lessee is not allowed to lop, or cut any tree, or make any plantation within a reserve of 25 arpents where the coco-de-mer palms grow under normal conditions. As soon as the lease of Marie Louise expires (1928), a reserve of 17 arpents already delimited, will also be made under the same conditions.

"It has been found by experience that coco-de-mer palms require moisture for their growth, and that they should not be suddenly exposed to the sun or scorched by bush fire during the first 40 years of their growth. Under these circumstances, it is imperative that the lessees should not be allowed the free enjoyment of the reserved areas, as in spite of all precautions, cleaning by fire or by removing shade trees will cause the destruction of young palms. The two valleys in question are besides thickly covered with all other Seychelles palms except *Roscheria*, and they form a unique spot.

"There are, besides these two valleys, other Crown lands, viz., at Curieuse Island, where the palms are also protected under special clauses of the lease. As at Marie Louise and Fond Ferdinand, the lessee has no right to injure or cut the heart leaves. They are granted permission to gather the fallen ripe nuts for sale. At Fond Ferdinand the lessee is bound to

plant 25 nuts every year. Savoie, New Come, Anse Kerlan, Anse Georgette, Pointe Chevalier, Fond Boffay, Pointe Zanguilles are other Crown lands of Praslin where coco-de-mer palms grow here and there, but on these Crown lands the soil is too much worn out to allow the palms to grow under normal conditions, and they are all stunted in growth.

"Attempts to grow coco-de-mer palms in Maho have succeeded well. There are a few at Government House and at the Botanic Station which are bearing. Therefore, no apprehension need be felt regarding the disappearance of this unique species of palm."

Studies in French Forestry.*—This book is the work of Mr. Theodore S. Woolsey, Jr., a consulting forester of the United States, America, and executive member of the Inter-allied War Timber Committee, Paris, 1917–1919, with two chapters by Mr. William B. Greeley, an official of the United States Forest Service. The work is in English and is descriptive of the principal features of French Forestry as they appeal to a foreign student, amplified by extracts from French literature and observations by French forest officers. The book was in course of preparation before the war, but its publication was postponed, and it now carries French forestry to a post-war date. This will give it considerable historic value in the future, for it not only places upon record the important part played by the forests of France in the prosecution of the late war and describes the activities of the Forestry Section of the United States Army in France, but indicates the ingenious methods and precautions adopted by the French people to preserve their forests from destruction, and to maintain as far as possible the sequence of their working plans, without starving the allied army or seriously crippling French industry by too strict economy in the provision of timber. The first chapter reviews the economic, legal, and administrative problems affecting the forests and is followed by a chapter describing the influence of the forests on the country, climate and people. The various forest regions are then reviewed and descriptions given of the various commercial trees, and the steps taken to establish and preserve forests in places subject to serious soil erosion, the control of erosion in mountainous regions being given special prominence. Considerable space is devoted to the historic and economic associations of the resin- and turpentine-yielding forests of Maritime Pine established upon the sand dunes of the Landes and Gironde, but the subject is not overdone, for this is one of the classic illustrations of a large area of waste, desolate, and unhealthy land, which provided a precarious living for a few peasants, being transformed into a valuable residential

* "Studies in French Forestry," by Theodore S. Woolsey, Jr., with two chapters by William B. Greeley, published in New York by Messrs. John Wiley & Sons, Inc., and in London by Messrs. Chapman & Hall, Ltd., 1920. Price 36/- net.

and revenue-producing region, carrying a considerable population solely by the establishment of forests. Working plans, mensuration, general forest administration and the work of the American Forest Engineers in France are given due attention in other parts of the book, whilst there are twelve appendices dealing with special subjects, such as the forest and springs; forests from a physical, economic, and social view-point; silvics of important forest species; statistics of public and private forests; French forest literature (with over 900 references); German comments on French forestry with a comparison with German methods; forests of Alsace-Lorraine, etc. In order to establish the American Army as a fighting unit in France and to carry its operations to the end of the war we are told that it required 450,000,000 board feet of round or manufactured timber and 650,000 cords of fuel wood. This was at the rate of $1\frac{1}{2}$ tons for every soldier sent and 75 per cent. of it was cut from the forests of France. The work numbers 550 pages, including a number of illustrations and a good index. Although it deals solely with matters in France, it is a book for general study, and should find a place in the library of every forester and in every class room where forestry is taught. W. D.

Eleocharis Jamesonii.—This Cyperaceous plant was collected by *Jameson*, No. 369, on the Savannah of Guayaquil, Ecuador, and referred by Steudel to the genus *Chaetocyperus* under the name *Chaetocyperus Jamesoni*, Steud., Syn. Pl. Cyper., p. 74.

Whilst endeavouring to identify a West Indian species of *Eleocharis* I found that Jameson's plant had never been recognised as being a member of this genus to which it properly belongs and it is therefore placed there under the original specific name as follows :—

Eleocharis Jamesonii, *N. E. Brown* [Cyperaceae-Scirpeae], comb. nov.—*Chactocyperus Jamesoni*, Steud., Syn. Pl. Cyper., p. 74. N. E. B.

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